U. S. DEPARTMENT OF AGRICULTURE.

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THE CATTLE TICK

IN ITS RELATION TO SOUTHERN AGRICULTURE.

BY

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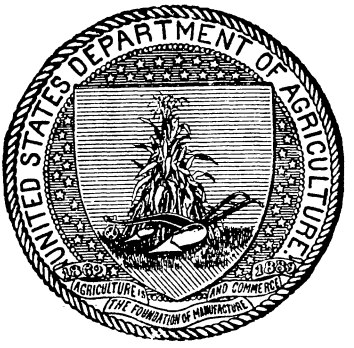

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., May 26, 1906.

SIR: I have the honor to transmit for publication as a Farmers' Bulletin the accompanying article on "The Cattle Tick in its Relation to Southern Agriculture," by August Mayer, of Shreveport, La.

Mr. Mayer presents the subject from the standpoint of the practical farmer in the tick-infested area. He points out graphically the disadvantages to cattle raising in the South, the enormous losses due to the cattle tick, and the great importance of its eradication, but does not take up in detail the means to be employed. This latter phase has already been treated by Dr. John R. Mohler, of this Bureau, in Bulletin No. 78 of this Bureau and in Farmers' Bulletin No. 258. Persons desiring fuller information as to the pasture rotation, feed lot, and other methods of repression and eradication, or a description of the tick and of the disease which it transmits, are referred to those bulletins.

The very important influence which the Texas fever tick has upon the southern cattle industry has long been recognized by this Bureau. Indeed, the problem of controlling the disease has occupied our attention from the first, as will be seen by reference to the First Annual Report (for 1884) of the Bureau. Several years later the true cause of Texas fever was revealed by the Bureau's investigations, and since then the tick question has continued to receive unremitting attention to the extent of the authority and means at the command of the Bureau. The time now seems ripe for the Federal Government and the governments and people of the affected States to unite in practical and systematic measures having in view the ultimate eradication of the tick pest from our country.

Respectfully,

A. D. MELVIN, *Chief of Bureau.*

Hon. JAMES WILSON,
Secretary of Agriculture.

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THE CATTLE TICK IN ITS RELATION TO SOUTHERN AGRICULTURE.

INTRODUCTORY.

The appearance of the Mexican cotton-boll weevil in some of the cotton States and the probability of its spread over the entire cotton-producing area of our country is apt to prove a powerful reformer in our present agricultural methods. It has been shown by the researches and experiments of the United States Department of Agriculture that, if it is not quite impossible, it is very unsafe to attempt the raising of a cotton crop by the old easy-going methods with the boll weevil present, and that a more intelligent, a more rapid, and generally a more intense cultivation is necessary to insure success. This means that a much smaller area must be planted in cotton than heretofore. It is believed that 50 per cent of the cotton area must ultimately be put to other uses. The presence of the boll weevil also makes it necessary that these lands should be kept in a high state of fertility.

All this points to the necessity for the production of live stock on the future cotton plantations. In other words, the Mexican cotton-boll weevil has sounded the death knell to old-time conditions; the cotton plantation of the past will soon be a thing of remembrance only. In the near future we shall have farms where various and sundry crops are raised and where cotton will constitute the ready cash crop. It is easily seen that when such a condition once prevails throughout the Southern States it will bring great and lasting prosperity.

The mildness of the climate, which permits the growing of some green forage the year round; the need of only inexpensive shelter, and the enormous capacity of soils in the growing of forage crops, all point to the rearing of cattle as one of the chief future industries on our farms. Indeed, in those districts of the cotton belt where preparations were made in advance for meeting the new conditions created by the boll weevil, many cotton planters have already undertaken the raising of cattle as a substantial feature of their business. With nearly all of them it is a new development, and whatever "tricks" go with this new business will now have to be learned. The learning of a new trade has invariably to be paid for. It is quite natural, therefore, that we should look about with caution, so that the new order of things may not be brought about at too great a sacrifice.

DIFFICULTIES OF THE CATTLE INDUSTRY OF THE SOUTH.

The cattle industry has already been tried to some extent in the South. The results obtained have been questionable, and in many instances very discouraging. An obstacle has been encountered that will assume a more formidable character as the business of growing cattle is extended, and, unless removed, will ultimately make such a business well-nigh impossible. It has been discovered that the fever-transmitting cattle tick, *Boophilus annulatus*, infesting a herd of cattle is perhaps more destructive than the boll weevil in the cotton field. This being so, one can quite well foresee that the tick question will soon concern and agitate the southern farmers to as great an extent as does the boll-weevil question; and that, if the former is not speedily taken in hand, the distress caused in the near future by this tick will in many localities exceed that caused by the boll weevil.

I speak from an extensive and intimate experience with this tick for a number of years, during which time I have endeavored to rear pure-bred and also market cattle with the idea of making my cotton crop a "surplus." Thus far I have not succeeded in the attempt, and I feel it my duty to extend to my fellow-farmers a word of warning and advice to the effect that they first make themselves thoroughly familiar with this pest, and what its presence means, before engaging in the rearing of any kind of cattle. I consider this enemy to the southern farmer so great and so dangerous, in the light of future requirements, that it is absolutely necessary for the people of the infected States to be fully informed concerning its nature and ravages, and that such steps be taken in cooperation with all concerned—the State authorities, the landowners, indeed every citizen residing below the quarantine line—as will lead to the complete eradication of this harmful pest from our country. Since there is no hope and possibly no real desire to escape from the impending change in southern agriculture, and since it is the cow which has from time immemorial been one of the foremost factors in a permanently successful agriculture, her time-honored position should not be denied her.

EFFECT OF THE TICK ON SOUTHERN CATTLE.

So long as there appeared no absolute necessity to look beyond cotton for a means of subsistence there was little occasion to study the live-stock situation in the South. Few ever gave the matter any serious thought. What little stock was reared in the country, especially cattle, was almost without exception left to its own fate, from birth to death. That only scrubs could thus be produced is very evident. It was taken for granted that in the Southern States no better cattle could be raised, and the reason invariably assigned was that the

South was not a cattle country. When, for some reason or other (really because the animal remained tick free and received rational treatment), an exceptionally fine animal was produced, a ready explanation of the phenomenon was found in the assertion that the animal had been "pampered," and that the production of like thrifty animals was, therefore, beyond the province of the farmer and could not be profitable.

In explanation of this matter let me begin at the very beginning and state that, while calves are resistant to Texas fever, they are not born immune to the disease. This fact was not understood at all until recently, and is yet almost unknown among the cattle owners of the South.

In the early and unrecognized infection of calves will be found the reason why we have harbored in the South the idea that our country is unfit to produce good cattle.

When a calf is born on southern soil it usually becomes infested with the cattle tick at an early period of its life, and suffers an attack of Texas fever—mild or severe, according to the degree of infestation and perhaps other conditions. If it does not succumb to the disease it invariably receives a setback. In short, most calves affected with Texas fever and receiving no special care simply become stunted, and the result is the runty cattle which are seen everywhere in the South.

But if, for some reason, the calf fails to become infested with the cattle tick, and is consequently spared from an attack of Texas fever and is given enough to eat it develops just as if it had been born and reared in Canada or any other part of tick-free North America. The blood in its veins and the feed and care given it determines its growth and general development. With good breeding, good feed, and a kindly master the animal born in the South, if kept tick free, will develop normally, uninfluenced by latitude, and no more deserves to be called "pampered" than the healthy, well-nourished, and well-cared-for cattle of the rich prairies of Iowa or the deep bluegrass pastures of Indiana or Kentucky.

The question of breeding is secondary to that of tick infestation. The best blood will not overcome the effects of the tick, nor will the amplest feed nor the best of care. Good blood in the South will tell in the same manner, however, as elsewhere, so long as the animals are kept tick free. The writer has brought from the Northern States fine specimens of purebred cattle and has kept them free from ticks in the State of Louisiana for several months. They went on in their development as if they had never been transferred from their native pastures. It is the same with purebred calves born in the South on tick-free areas and kept tick free. I have reared such calves that were a fair match for those found in good northern herds. But the time came when they had to be "immunized." The tick had to get hold of them, and what

a cruel transformation soon took place! Such cattle may retain their excellent shape and show their excellent breeding, but they never attain the size which they promised to attain before they had a touch of immunization, and while they may in shape and bodily form and breeding be proper candidates for championships, their smaller size—the result of tick infestation—will stand forever in the way to such honors. Moreover, if a calf in its babyhood should escape sufficient harm to be stunted from the start, subsequent gross tick infestation will bring about the same result. Take it as you will, it may be put down as a fact that the cattle tick stands uncompromisingly in the way of a healthy cattle industry on the southern farms. The presence of the tick is the sole reason why the South is not a cattle country.

What does the tick mean to the average farmer? Can we expect of him the never-ceasing vigilance required to keep his cattle tick-free, or fairly so, after they have once become "immune," as it is called? Those who have attempted it have found themselves beaten in the end. The task is irksome, laborious, and expensive, and often void of the desired results. Losses due to tick infestation occur, followed by discouragement and final abandonment of the industry.

A cattle industry with the foot-and-mouth disease present has about as much prospect of success as one where the cattle tick is present in great numbers. Perhaps this may appear to some as an exaggeration, for it is well known that in a part of the tick-infested territory a profitable cattle industry has been carried on for some time. My remark, however, is not intended to apply to the great open ranch country, where it takes a number of acres of ground to sustain one animal, but particularly to that part of our country made up of farms of all sizes, where the pastures are small and of great carrying capacity, such as at present are found mostly on our cotton plantations. Raising cattle on the very extensive, sparsely grassed pastures of the range country is quite different from raising them on the fat pastures of the cotton States, with ample protection of woodlands, hills, and valleys. Where cattle may roam over a large area the mature ticks are only dropped here and there. This, of course, greatly reduces the chances of the seed ticks being picked up by passing animals. Very many of them will perish, since a few months without food—that is, blood from the living animal—seems to suffice in summer to starve the seed tick. It is a fact, too, that the severity of the winter climate in the northern section of the infested territory destroys many ticks, especially on the exposed prairies. On a farm, however, in the States bordering on the Gulf, where the pastures are good and where often 1 acre will carry a full-grown animal for ten months of the year, mature ticks are scattered almost at every place where a cow is apt to seek rest. Cattle in such pastures will lie down in the midst of swarms of seed ticks

time and again, and, since the brood of a single female in one spot may and usually does consist of two or three thousand of these tiny pests, the cattle become literally covered with the parasites early in the season, and will remain so if resort is not had to some artificial means to remove them. But it may be readily seen that frequent washings or dippings will be only of temporary benefit to cattle on such grossly infested pastures. The number of ticks lying in wait for the host is simply overwhelming, and reinfestation goes on without material interruption, so that permanent gross infestation is the usual result. This will be still more apparent when we consider the possible number of ticks produced during one season.

POSSIBLE PROGENY OF ONE FEMALE TICK.

In the Gulf States four generations of ticks will often be hatched in one season. Suppose we have two eggs carried over the winter that hatch by April 15, a male and a female. This female will have become engorged and will have laid about 3,000 eggs by May 15, and these eggs will have hatched by June 15. Fifteen hundred of these seed ticks may be females, and these will have become engorged and will have laid 1,500 times 3,000—that is, 4,500,000 eggs—by July 15. By August 15 these eggs will have hatched, one-half, or 2,250,000, being females, which by September 15 will have become engorged and laid 2,250,000 times 3,000, or 6,750,000,000 eggs, and these will hatch by October 15. One-half of these—that is, 3,375,000,000—being females, will engorge and drop irregularly and go through the winter as adults, or will lay eggs that may pass through the winter and be ready to hatch during the first seasonable weather in the early spring.

Of course such a multiplication can not happen, as such a number of parasites would destroy their hosts, and the species would thus destroy itself. Nature does not work that way. To preserve the species she destroys a goodly number of all broods, and thus preserves the host and the tick. But the figures show that, if the host is furnished, the ticks will multiply so enormously as to endanger the existence of the host. In other words, it is quite possible for the ticks, as parasites, to kill cattle outright.

INCREASED TICK INFESTATION IN SMALL PASTURES.

The actual death of cattle from tick infestation may more easily happen if cattle are put on rich pastures of limited area and kept there for a few seasons, more especially if these pastures are occupied winter and summer. I have had this experience repeated on several pastures. In the season just past (1905) I put into a good pasture of 400 acres 164 cattle, all so-called natives, many born in this inclosure

a year or two before, others having been used for a number of years as milch cows. This pasture was an ideal summer home for cattle, with grass in plenty and of good variety, good spring water, shade, and high airy ground. Of the 164 head, 42 succumbed to the ravages of the tick, and the rest, with the exception of some thrifty grown steers, were reduced to skin and bones; and this in the midst of plenty! Like experiences resulted on various other pastures of smaller areas. Stocking these pastures to their full capacity always meant ticks in ruinous numbers. Where cattle are confined to a certain tract, especially when wooded or spotted by shade trees, they habitually gather in certain favorable resting places every day, here in the forenoon and there in the afternoon. In summer when the flies are bad the whole herd may be found together in the deepest shade in the woods. These favored and regularly frequented spots become extremely infested and remain so the whole year round, and it is evident that the cattle when lying down in these places must become literally covered with seed ticks. I have seen the poor creatures so heavily infested that it seemed there was no place on the entire body covered with hair where there was enough room left for another tick to attach itself. Even the eyelids between the eyelashes were studded with these blood suckers. In one instance a large cow—not belonging to the writer, however—had even her nose completely covered with grown ticks. I estimate that a large animal may thus carry at one time several hundred thousand ticks of different stages of development, perhaps even as large a number as half a million. Since four different broods may be carried per season, it will be seen that about two million female ticks might engorge themselves in one season with the blood of a single animal.

DRAIN ON THE ANIMAL BY TICK INFESTATION.

An engorged female tick weighs about five grains; so 1,500 ticks of average size will weigh about one pound. Nearly all this consists of blood drawn from the host during two or three days, the period of engorgement of the tick. Three hundred thousand ticks will withdraw 200 pounds of blood from the victim; and, since several broods mature in one season, it will be seen that the ticks may deprive the animal while he is on the pasture of several hundred pounds of his substance. Since a thrifty animal may increase in weight 400 pounds on grass during one season (such a gain, of course, being the exception and not the rule), it can be readily perceived why it is that even the best of cattle on the richest pasture, when the same is grossly infested with ticks, may grow poorer from day to day, or even starve to death, as was the case in the experiences cited above. Then there is, in addition to the actual loss of blood, the never-ceasing irritation caused

by the ticks and the sores which their bites induce, and hence the consequent lack of rest for the animal. Its existence is beset with continuous suffering.

OTHER TROUBLES CAUSED BY THE TICK.

Cows heavily infested with ticks often fail to bring calves or become irregular breeders. Heifers especially are frequently hard to get in calf, and in many instances after conception early abortion follows. This seems to show an unnatural condition of the reproductive organs induced in some way by the tick.

Another serious trouble following continued infestation is extreme depletion of the system, ending perhaps oftener than is now realized in tuberculosis or possibly some other wasting disease. An animal which has been grossly infested for a long time grows very poor and weak, and seemingly loses all interest in life. It stands in great dejection as if awaiting its final fate, with dull eyes and drooping ears, until death puts an end to its troubles.

THE TICK AN OBSTACLE TO PROGRESS.

Here, then, we have a deplorable condition, and one fraught with danger to the southern farmer. A change to more diversified methods of agriculture in the South has become a necessity, and is actually forced upon us by natural events. For a number of years all the teaching of our agricultural institutions and authorities, National and State, has been for a variety of crops and for the rearing of live stock. The cow has been recommended as the never-failing ally of the farmer. The people have at last taken notice of the recommendations made by the authorities, and are preparing to carry them into effect. Hence the cattle tick at once rises to great prominence. It had been overlooked as standing in the way of progress, but it can no longer be neglected. We must progress on the lines laid down for us by our agricultural authorities. Their instruction is based upon sound reasoning and upon long experience in other sections of our country, or in countries beyond the seas. And we have fully come to recognize the fact that before their well-seasoned conclusions can apply to our section of the country, conditions must be created similar to those existing where their doctrines were evolved and sustained by long trial.

To align the Southern States in their agriculture with the prosperous States north of them, and to afford their farmers an equal opportunity of wresting from the soil a livelihood, or a surplus to add to our national wealth, they must be freed of this bane to all progress; the cattle tick must go. It is useless to attempt the agricultural regeneration of the South without this cry as our main slogan. The cattle tick

is a formidable barrier to our turning gulfward the host of stalwart experienced farmers now leaving the Northwest for Canada, of whom our southland stands so much in need.

REMEDIES.

For a decade or so investigations have been carried on by the United States Department of Agriculture, and also by several State experiment stations, to learn the nature of this tick. Its life history has been well studied, especially at the Louisiana station and by the Bureau of Animal Industry, and many remedies against the tick have been recommended. Observations in certain portions of the infested territory, however, point to the adaptation of the tick to changed conditions, and it seems necessary to extend the technical investigations of the life history of the tick over the entire tick-infested area before practical conclusions looking toward remedial work and final eradication can be safely made.

DIPS AND WASHES.

The remedies suggested and widely used in the form of washes and dips are more or less efficient in the destruction of the ticks. In some sections of the ranch country the Bureau of Animal Industry has carried on experiments which point to the great usefulness of such dips in the eradication of ticks under certain conditions. But it is quite doubtful if a dip has yet been offered which has proved successful as a tick destroyer that does not produce a deleterious effect upon some animals. This is especially true when these remedies are applied to high-bred cattle, or cattle of a nervous temperament. The Bureau of Animal Industry, however, is still experimenting to discover an entirely satisfactory dip. But even after a thoroughly satisfactory substance has been discovered, dips placed in the hands of the millions of farmers as a remedy against the tick would still in all likelihood prove a mere expedient, the usefulness of which would largely depend on the intelligence and perseverance of the users. Under certain conditions they might even prove of greater harm than good by impressing the poorly informed or shiftless with too great a sense of security against tick damage; and the neglect of other precautionary measures would soon bring on disaster, with the accompanying discouragement and final abandonment of the industry. Besides, the repeated use of washes and dips is expensive, more so on the farm than on large pastures where dipping would be done wholesale and not nearly so often. These washings are usually very troublesome, as they come at a time when other farm work is pressing and when labor is scarce.

The practice of using washes is, consequently, not always satisfactory. It provides a certain relief to the animal, it is true, but washing the

host does not strike at the root of the evil. Under actual farm conditions an abundance of ticks will remain, always ready to renew the mischief at the first opportunity. Under such trying circumstances the southern farmer thinks of the cattle industry above the quarantine line, and wonders how it will be possible for him to compete with a section which enjoys immunity from the great pest. And it is also quite apparent that, with these difficulties confronting him, dismay and disgust will quite likely possess any northern stock farmer who may have come to try his fortunes in the South.

ARTIFICIAL IMMUNIZATION.

Investigations by scientists have evolved a method of "immunization" by the subcutaneous injection into a susceptible animal of blood taken from a tick-infested native animal. In this manner a mild case of Texas fever is induced in the non-immune animal. This discovery has been hailed by many as the solution of the tick problem. This view of the matter is a grave mistake. The real tick problem has not even been touched by this discovery. All we can claim for this treatment is that the mortality of susceptible stock imported into the tick territory can be greatly reduced, so much so that the losses sustained in the importation of purebred, non-immune cattle need not exceed 8 per cent, whereas before this discovery was made these losses amounted to 50 per cent and sometimes considerably more. It is very apparent, however, from what has been said, that this discovery offers no solution for the tick problem proper which confronts the husbandmen of the tick-infested States.

ROTATION OF PASTURES.

A remedy possessing real merit for evading or mitigating the damage done by the tick has been found in the rotation of pastures. Owing to the fact that the tick can live only a certain length of time without food, it is possible to rid a pasture of the parasite by keeping all stock out of it for this length of time. This will of course necessitate a double set of pastures, so arranged that tick communication from one pasture to the other, or from the outside, is not possible. But one or more of the following dangerous possibilities may have to be contended with. Water courses running through these pastures and coming from tick-infested territory may bring eggs and seed ticks from a distance and reinfect the pastures. If the pastures are subject to occasional overflow from rivers the same trouble may result. Further difficulties might be created by a neighbor who might see fit to have a ticky pasture alongside of yours, which is free from the pest. Or some neighbor's ticky bull might break through the fence and drop a tick, which, as previously seen from the family record of a single

female, would cause havoc before a single season was out. Or the tick may be brought in through feed, especially hay. Altogether, it is evident we must reckon with the tick evil everywhere and at all times, so long as we have ticks in the country.

We can not risk having susceptible animals on our farms, because an accidental infestation would create havoc in the herd and perhaps wipe it out entirely; and as long as we have a tick-infested territory as a market, it would be folly to raise susceptible animals and sell them to unsuspecting customers who have ticky pastures, and possibly know little or nothing about the tick and the danger it brings. All our cattle must therefore be immune.[a]

A farmer who already possesses a double set of pastures to secure himself from the ticks must also have one or more ticky pastures to immunize his animals while young. And when they have become thoroughly immune the animals will have to be again freed from the ticks before they can be put in the tick-free pasture with the older cattle. This deliverance from the ticks is most economically accomplished by a set of feed lots, which system is described in Bulletins Nos. 82 and 84, of the Louisiana Experiment Station, Bulletin No. 1, vol. 18, of the Tennessee Experiment Station, Bulletin No. 78 of the Bureau of Animal Industry, and in Farmers' Bulletin No. 258. No matter how efficient or how helpful this method may be, it is not always practicable. The several pastures to be maintained, some tick free, some with ticks, together with a series of feed lots sufficient in number to have one set available all the time, involves altogether too much of a system for the average farmer, and are, moreover often found impracticable on the smaller farms. And then, in addition to all this, lasting success of these arrangements is still dependent on factors often beyond the control of the individual farmer. So, while the pasture-rotation and feed-lot methods are by far the best weapons yet invented with which to meet the tick enemy (which methods I may add, incidentally, must be employed by most of the southern farmers so long as we have to contend with the ticks, in order to derive a fair profit from cattle growing), they are still only makeshifts, constituting a considerable burden and a great drawback to our cattle industry.

ERADICATION OF THE TICK.

What have these experiments in the rotation of pastures and feed lots determined? They have brought to light the most vital fact in the whole tick problem, namely, that the tick can be surely and easily destroyed, and in a manner entirely practicable throughout the infected territory.

[a] As there is no such thing as "tick immunity," the term "immune" is used to express insusceptibility to acute or severe attacks of Texas fever.

The methods of eradication will probably not be exactly the same everywhere, owing to climatic, and possibly other, differences. These conditions will have to be studied and methods adapted thereafter for each locality. We know, for instance, that one summer's starvation in one place, or complete exclusion of cattle from a pasture during the winter months in another, will suffice to kill the ticks. If reinfection can be prevented we have the tick problem solved. By simply "starving out" the ticks we can exterminate them and bring about the same favorable conditions that now exist above the quarantine line. Should this freeing of pastures from the tick occur along the present quarantine line, as it has in a number of counties in several States, then the newly cleaned area will be admitted to the favored cattle-growing region above the quarantine line. Should it occur deep within the quarantined territory, then the newly made tick-free land could be granted favors in its cattle industry by the Government not enjoyed by the ticky territory surrounding it. Of course, this island of tick-free land would have to be protected by a strict quarantine against all neighbors, which would once more complicate trade relations. However, whatever methods of tick eradication may be found best suited to the different localities, the tick can be made to go, and will only remain a terror to southern cattle and a great handicap to southern agriculture by sufferance.

THE ENORMOUS LOSSES CAUSED BY THE TICK.

What it costs the Southern States to harbor the cattle tick is not easily calculated, but from observation and experience we can estimate this loss with some assurance of approximating the truth. I shall therefore proceed to state this matter as I see it, and while I can not claim accuracy for the conclusions reached, they will serve their purpose by showing that the loss must be truly appalling and that our country can not sit idly by and let such waste of wealth continue.

THE SHRINKAGE IN THE VALUE OF SOUTHERN CATTLE.

Below the quarantine line we have something over 15,000,000 cattle' the total farm value of which is given by the last census as nearly $183,000,000. The dairy cattle are credited with a value of about $58,650,000, and the other cattle with over $124,000,000. From observation and experience I estimate that a shrinkage in value of 20 per cent in cattle other than dairy cattle is due to the effects of the cattle tick. In round numbers this would mean a loss of $25,000,000 for beef cattle.

The dairy cattle, being better cared for and to a large extent confined in lots where the ticks do not flourish or even exist, suffer less damage. Nevertheless considerable damage is experienced in a great

many instances, especially in the country, because of the extra feed required and the skrinkage in the flow of milk caused by tick infestation. It is believed that an estimate of 5 per cent of the total value of the dairy cattle is not overcharging the tick. This means an annual loss of nearly $3,000,000 for dairy cattle. The total depreciation then of southern cattle on account of the tick would be $28,000,000.

LOSSES BY DISEASE AND EXPOSURE.

But there is also chargeable to the tick a great number of deaths, from either acute Texas fever or great depletion or induced tuberculosis or kidney diseases, which deaths are often attributed to some other causes or are not understood at all.

In a large part of Texas along the Gulf coast and northward much damage results from the screw worm (the larva of a blow-fly *Lucilia macellaria*) infesting cattle. This extensive infestation by the screw worm is sometimes made possible by the tick, which, while attached to its host, furnishes the opening in the skin of the animal for the parasite to enter, or, when crushed upon the animal, the blood necessary for its development.

There are no direct statistics available to compute this loss; nevertheless we can get a fair idea of what it may amount to by consulting the tables of the Bureau of Statistics, Department of Agriculture. The average death rate among cattle in the tick-infested area for the year 1904–5 was about 8.33 per cent; in the tick-free area it was about 3.12 per cent. In the States of Ohio, Indiana, Illinois, Wisconsin, Minnesota, and Iowa, where the winters are severe but where the cattle industry is carried on intelligently, the death rate was about 2.4 per cent. In the New England States it was still lower. Excepting New Mexico, we find that the death rate from exposure was twice as great in the tick-infested States as in the tick-free States. In the Middle States the death rate from exposure was about 0.5 per cent. In Connecticut and Rhode Island it was nothing. In Florida it was 3.1 per cent, and in Louisiana nearly 9 per cent. That is, in the States with the mildest winters the loss from exposure was greatest, reaching its height in the State of Louisiana, where the inclement days of winter are few, although it should be stated that during the winter of 1904–5 we had a "nasty spell" of greater severity and longer duration than usual.

Now, we know that the loss from exposure in the Southern States is partially due to the negligence of the people in regard to their cattle. Seldom is any provision made for shelter or additional feed. The cattle usually have to shift for themselves the best they can. But even then the excessive death rate from exposure can not be wholly explained by these facts. Nor can we explain the much higher death

rate from disease in the tick-infested territory as compared with that of the tick-free States by simply averring in a general way that the South is unhealthful for cattle; for, after eliminating the cattle-tick pest, we know that quite the contrary is the case.

The excessive loss from exposure and disease in the tick-infested States must be ascribed to the tick. The loss in the States with the most equable climate is greatest because tick activity is greatest there and the tick season is the longest. The cattle in the tick-infested States, by reason of the ravages of the tick, enter upon the winter thin and depleted, and without any reserve energy, whereas the stock above the quarantine line are in good flesh and full vigor. The tick in too many instances has devoured all the substance the animal has derived from the land and often even more; consequently impoverishment, depletion, debility, and general misery are too often the grim companions of southern cattle during the winter season. An animal well nourished during the grazing season of the year, and without tick incumbrances, would not succumb to the few inclement days we have in the South; but the tick does the work of destruction well in advance, and does it thoroughly. The 800,000 cattle that died in the year mentioned in the quarantine territory in excess of the death rate of the territory above the quarantine line may be justly charged to the tick, that is, the sum of $9,600,000.

Or, looking at it another way, the total number of cattle that died in the tick-infested area during the year ended March 31, 1905, was about 1,250,000, death being attributed largely to exposure. This loss constitutes nearly 50 per cent of the total loss suffered by the whole country, and yet the tick-infested States contain barely 25 per cent of the country's cattle. The average farm value of these southern cattle—both milk and beef breeds—may be put at $12, according to the Bureau of Statistics; therefore the total annual loss from death in the tick-affected States amounted to $15,000,000. The average death rate in the quarantined States being nearly three times as great as that in the tick-free States, it is not unfair to assume that two-thirds of this loss by death is directly attributable to the tick, that is, $10,000,000.

MISCELLANEOUS LOSSES.

In the writer's opinion there is a further loss to be recorded against the tick in the reduction of the fecundity of the female cattle, and perhaps also in the greater proneness of tick-infested cattle to diseases or abnormal conditions of the reproductive organs, bringing about abortion. This loss is often severely felt in herds of purebred animals.

Then there is also chargeable to the tick the greater expense of providing pasturage or extra feed for the cattle during heavy infestation,

for dips and other preventive measures, and for extra care and extra supervision.

It is deemed a conservative estimate to place the annual loss under these two heads at $8,500,000.

The total direct annual loss thus enumerated amounts to $46,500,000.

But this is not all: There is another material charge to be entered against the tick. With tick infestation at babyhood—the only time when the animal may with a degree of safety pass the ordeal—there is very little chance to bring cattle to early maturity. The stunting which they usually receive obliges us to carry them until they are three or more years old. A "baby-beef" industry with the tick infesting our cattle is not possible. Therefore, instead of being able, like the farmers above the quarantine line, to market cattle when they are twenty-four to thirty months' old, we have to carry them two or more years longer. That means two years of extra feed and care, and capital tied up unnecessarily by adverse conditions. It costs easily from $5 to $10 per year to provide and care for a cow; and to keep our 12,000,000 beef cattle a year or two longer means, accordingly, an extra outlay of at least $60,000,000 per year, not mentioning the interest on the dead capital of some $125,000,000.

Let us look at this subject of damages in still another light. The average value of southern cattle is $7 below that of northern cattle. In the State of Arkansas the beef cattle are given a farm value by the Bureau of Statistics of $7.50 per head. The cattle of Iowa, also a Mississippi Valley State, are valued at $19.42—almost three times as much. Does it not appear strange that there should be such a sharp break in the value of cattle in States so near together and so similarly situated? Forgetting for the moment the particular difficulties which are always facing the agriculturist of the South, it may be permissible to imagine that if the southern lands were not infected with the cattle tick they would very soon produce cattle of average value equaling those of the Northern States. Not that the Arkansas brindle, worth, with his hide on, $7.50, would ever produce a Shorthorn worth several times that sum; but the rearing of good cattle being made possible, the people would unquestionably take to breeding good cattle rather than waste their time on scrubs. In other words, the 12,000,000 cattle of better blood, in place of the 12,000,000 scrubs, would make the valuation of our cattle about $84,000,000 more than it is to-day. It is also easy to believe that the Southern States, with so many things favorable to cattle growing, and the tick gone, would soon double and even treble their number of cattle. The benefit that would accrue from this additional asset is now denied us because of the tick. To sum up, it appears that the tick, scrub cattle, and poverty are interdependent associates.

Then there is the loss caused by the special transportation and yard facilities that have to be provided, which finally will all come out of the pockets of southern cattle owners.

There is also the loss caused by the interference with free and unmolested traffic, and the lower price obtained at the markets on account of the necessary regulations. And finally there is the cost of the inspection service and the maintenance of the quarantine.

It is very easily seen that the annual loss sustained by the Southern States to-day must amount yearly to an enormous sum, $100,000,000 being named in the Yearbook of the Department of Agriculture for 1904; and outside of the State of Texas we have no cattle industry to speak of in the South.

BENEFITS THAT WOULD FOLLOW TICK ERADICATION.

One of the greatest benefits that would follow the eradication of the tick would be the increased fertility of the soil that would naturally result from a great cattle industry in the South. Instead of exporting as now to foreign countries—not to include that which is shipped to our Northern States—over 1,000,000,000 pounds of cotton-seed meal yearly, which, if converted into beef, would bring from $6,000,000 to $10,000,000 more than we receive for it from abroad, we would feed it to our cattle, and thus keep at home the enormous amount of fertility of which we now rob our farms, besides securing the $10,000,000 extra value for the finished product. The fertilizer saved to our lands would represent $10,000,000 in direct value. So, by failing ourselves to feed the cotton-seed meal which we send to foreign cattle feeders, thus enabling them better to compete with us, we sustain a direct yearly loss of some $20,000,000.

But there is a loss, more or less potential, closely connected with this part of the problem which is of much greater significance than perhaps any or all the losses yet mentioned. To keep secure the practical monopoly of the South in supplying the world with cotton it is absolutely necessary that we should not only maintain but increase the fertility of our soil. Under the conditions that will soon prevail all over the cotton States any impoverished soil will fail to yield a profitable cotton crop. A nonfertile soil will ultimately mean the ruin of our cotton industry in the South. The fertility of the soil must be increased, and this can only be done permanently by means of a healthy live-stock industry. Let cattle and other animals eat the grass grown on the farms and thus fertilize them; then with a rich and friable soil the boll weevil need not stand in the way of our continuing to raise the bulk of the world's supply of cotton.

If for no other object, then, but to maintain and increase the fertility of our soil, the cattle tick should be eradicated. Any amount of

money necessarily spent in its complete eradication will be a bagatelle compared to the benefits which would be derived. To speak of an annual loss, real and potential, of $100,000,000, or even $200,000,000, chargeable to the cattle tick is really far within the mark, since it does not nearly approach the entire loss sustained by our country, if that ever can be expressed in dollars and cents.

To eradicate the cattle tick from the Southern States of the Union means, therefore, to a large extent, the preservation of the supremacy of American agriculture. Above all, it means increased welfare and happiness to millions of our people.

FARMERS' BULLETINS.

The following is a list, by number, of the Farmers' Bulletins available for distribution. The bulletins entitled "Experiment Station Work" give in brief the results of experiments performed by the State experiment stations. Titles of other bulletins are self-explanatory. Bulletins in this list will be sent free to any address in the United States on application to a Senator, Representative, or Delegate in Congress, or to the Secretary of Agriculture, Washington, D. C. Numbers omitted have been discontinued, being superseded by later bulletins.

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24. Hog Cholera and Swine Plague. Pp. 16.
25. Peanuts: Culture and Uses. Pp. 24.
27. Flax for Seed and Fiber. Pp. 16.
28. Weeds: And How to Kill Them. Pp. 30.
29. Souring and Other Changes in Milk. Pp. 22.
30. Grape Diseases on the Pacific Coast. Pp. 15.
32. Silos and Silage. Pp. 30.
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35. Potato Culture. Pp. 24.
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60. Methods of Curing Tobacco. Pp. 24.
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